Terminology for eHR

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eHR Information Standards Office
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Discussion

• Introduction to Terminology
• Terminology for eHR
• Terminology in practice
eHR Components

- eHealth
  - On-ramp / Adaptation
- Core Infrastructure
- Standardization
Areas

- Registries
  - Patient
  - Practitioner / Institute
  - Location (address)
- eHR content
- Terminology
- Messaging
- Management process
Free Text Data

• Same word, different meanings
  – COLD, MI, diabetes, fundus

• Different words, same meaning
  – Oral, per oral, by mouth, P.O, orally

• Context dependent
  – Current compliant, past medical history, family history

• Negation
  – Explicit, e.g. denied chest pain
  – Implicit, e.g. clear lung

• Uncertainty
  – Probably, suggest, possible, likely

• Lexical variant
  – Anaemia vs anemia, hepatic vs liver
Terminology

• A finite, enumerated set of terms used to convey information unambiguously (a controlled vocabulary)
• Encode medical information so that computers can process the data easily
• Reduce complexity by restraining content (what can be said) and syntax (how it is said)
Purposes of Terminology

• Encode clinical information
• Facilitate the storage of clinical information
• Support sharing and reuse of clinical information
• Support efficient query formulation
• Create a natural language output from manual structured input
• Support the application of decision support algorithms
The World of Terminology

• There are so many of them:
  – Diagnosis/signs and symptoms - ICD9CM, ICD10, ICD10CM, ICD10AM, ICD-O, ICPC, ICF, SNOMED CT, Read Codes, MedDRA, CTCAE, WHOART, MEDCIN, DSM
  – Procedures - CPT, CDT, HCPCS, OCPS, SNOMED CT, ICD9CM, ICD10-PCS
  – Nursing - NANDA, NIC, NOC, OMS, HHC
  – Diagnostic tests - LOINC, UltraSTAR
  – Drugs - VANDF, NDC, RXNORM, NDDF
  – Medical devices - UMDNS, GMDN, SPN
  – Genomics - GO, HUGO, NCBI Taxonomy
  – ...

Standard Terminologies

• Numerous standards
  – Each serving a particular purpose
  – Reference for health informatics products, e.g. First DataBank

• No single terminology covers all domains

• Unavoidable mapping for various purposes / system design
  – Well management is needed

• Standard terminologies being updated regularly
  – Impact on data retrieval
    • Analysis / decision support / rules……

• Handling post-coordinated terms

• Implications
  – Select a few commonly adopted terminologies – each with sufficient breadth & depth of individual / several domains
  – Management for ongoing updates
Recognised Terminologies in eHR

• Registered Pharmaceutical Products (RPP)
• Hong Kong Clinical Terminology Table (HKCTT)
• International Classification of Diseases, 10th Revision (ICD 10)
• International Classification for Primary Care, 2nd Edition (ICPC2)
• Logical Observations, Identifiers Names and Codes (LOINC)
• Systematized Nomenclature of Medicine, Clinical Terms (SNOMED CT)
## Recognised Terminologies for HKCTT

<table>
<thead>
<tr>
<th>Reference Terminology</th>
<th>HKCTT Nature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Diagnosis</td>
</tr>
<tr>
<td>RPP</td>
<td></td>
</tr>
<tr>
<td>ICD-10</td>
<td></td>
</tr>
<tr>
<td>ICPC-2</td>
<td></td>
</tr>
<tr>
<td>LOINC #</td>
<td></td>
</tr>
<tr>
<td>SNOMED CT #</td>
<td>Yes *</td>
</tr>
</tbody>
</table>

* Mandatory mapping
# Local extensions created
Organisation Structure for eHR Information Standards

- Steering Committee on eHealth Record Sharing
  - WG-IA
  - WG-ERP
  - WG-LPS
  - Working Group on eHealth Record & Information Standards (eHR IS WG)
    - Technical Task Force
    - Co-ordinating Group on eHR Content & Information Standards
      - Domain Group on eHR Content & Information Standards

Note:
- WG-LPS: Working Group on Legal, Privacy & Security Issues
- WG-IA: Working Group on Institutional Arrangement
- WG-ERP: Working Group on eHealth Record Partnership
Hospital Authority
Clinical Vocabulary Table (HACVT)
Adoption of Health Information Standard

- HK Clinical Terminology Table (HKCTT)
- Mapped Local Terminology
- Recognised Terminology
- HKCTT
Allergy Checking In CMS On-ramp

Medication Order Entry

Display: Allergy: amoxicillin (as trihydrate)
Drug Name / Set: cloxacillin
Prescription:
- cloxacillin (as sodium) (Vickmans) capsule
- flucloxacin (as sodium) (Athlone) powder for elixir
- cloxacillin (Free Text)
Allergy Alert Prompt

Drug Allergy Checking

This patient has **CERTAIN** drug allergy to amoxicillin (as trihydrate). The clinical manifestation was **angioedema**.

Cloxacillin (as sodium) (Vickmans) may result in **ALLERGIC REACTION**.

If you wish to prescribe anyway, you must provide the reason(s) for overriding this alert:

- [ ] No other alternative available
- [ ] Desensitizing the patient with this drug
- [ ] Doubts about the report history of drug allergy
- [ ] Patient is administering this drug without allergic response
- [ ] Patient can tolerate the drug at lower dose
- [ ] Others (Please specify reason below)

Remarks

[Text area for remarks]

[Buttons: Prescribe with reason, Do not Prescribe]
# Hong Kong Medication Terminology Table

**Drug Checking Information**
- Active Ingredient
- Base Ingredient
- Allergen Group
- Cross-sensitivity Group

<table>
<thead>
<tr>
<th>Generic Name</th>
<th>Trade Name</th>
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<tbody>
<tr>
<td>VTM</td>
<td>TN</td>
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<tr>
<td>VTM + R</td>
<td>TN + R</td>
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<tr>
<td>VTM + R + F</td>
<td>TN + R + F</td>
</tr>
<tr>
<td>VMP</td>
<td>AMP</td>
</tr>
</tbody>
</table>

**RPP**
Allergy Checking

Cloxacillin vs Amoxicillin

Cloxacillin

Beta lactam antibiotics

Medication order entry...

Cloxacillin (as sodium) (Vickmans) oral capsule

HK-34691 cloxacillin (as sodium) (Vickmans) oral capsule 500 mg
Allergy Checking

Cloxacillin vs Amoxicillin

Amoxicillin (as trihydrate)

Amoxicillin (as trihydrate)

Beta lactam antibiotics

Allergic to...

Amoxicillin

Amoxiciilin (as sodium_ + clavulanic acid)
Allergy Checking

Cloxacillin vs Amoxicillin

- Cloxacillin (as sodium)
- Amoxicillin (as trihydrate)

Allergic to...

Penicillins

Beta lactam antibiotics

Medication order entry...

- Cloxacillin (as sodium) (Vickmans) oral capsule
- Amoxicillin (as trihydrate)

Augmentin (amoxicillin (as sodium) + clavulanic acid)

HK-34691
cloxacillin (as sodium) (Vickmans) oral capsule 500 mg
# Laboratory Result in eHR

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<thead>
<tr>
<th>Hospital Code</th>
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<th>NDH</th>
<th>PWH</th>
<th>AHN</th>
<th>PYN</th>
<th>KWH</th>
<th>PYN</th>
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<tbody>
<tr>
<td>Bilirubin, Total</td>
<td>6</td>
<td>---</td>
<td>6</td>
<td>4</td>
<td>---</td>
<td>6</td>
<td>13</td>
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## Bilirubin, Total in HA

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<td>A  B  C  D  E  F  G  H  I  J  K</td>
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<tr>
<td>BIL</td>
<td>1  1  1</td>
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<td>TBIL</td>
<td>1</td>
</tr>
<tr>
<td>TBIL1</td>
<td>1</td>
</tr>
<tr>
<td>VTBIL</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>1</td>
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## Standard vs Local

<table>
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<tr>
<th>Hospital Code</th>
<th>TMH</th>
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<th>PWH</th>
<th>AHN</th>
<th>PYN</th>
<th>KWH</th>
<th>NDH</th>
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### Presented with Standard Terminology

| Bilirubin, Total | 6 | --- | 6 | 4 | --- | 6 | 13 |

### Without Standardisation

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<th>AHN</th>
<th>PYN</th>
<th>KWH</th>
<th>NDH</th>
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</thead>
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<tr>
<td>BIL</td>
<td>6</td>
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<td></td>
<td>13</td>
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<tr>
<td>TB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td></td>
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## Set of 5
### Diagnosis – Level 3 Compliance

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<tr>
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<tr>
<td>1</td>
<td>SNOMED CT</td>
<td>233604007</td>
<td>Pneumonia</td>
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<td>2</td>
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<td></td>
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<tr>
<td>G80.0</td>
<td>Spastic cerebral palsy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Congenital spastic paralysis (cerebral)</td>
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<tr>
<td>G80.1</td>
<td>Spastic diplegia</td>
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<td>G80.2</td>
<td>Infantile hemiplegia</td>
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<td>G80.3</td>
<td>Dyskinetic cerebral palsy</td>
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<tr>
<td></td>
<td>Athetoid cerebral palsy</td>
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</table>

**v2010**

<table>
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<tr>
<th>Code</th>
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<td>G80.0</td>
<td>Spastic quadriplegic cerebral palsy</td>
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<td></td>
<td>Spastic tetraplegic cerebral palsy</td>
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<tr>
<td>G80.1</td>
<td>Spastic diplegic cerebral palsy</td>
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<tr>
<td></td>
<td>Congenital spastic paralysis (cerebral)</td>
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<td></td>
<td>Spastic cerebral palsy NOS</td>
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<tr>
<td>G80.2</td>
<td>Spastic hemiplegic cerebral palsy</td>
</tr>
<tr>
<td>G80.3</td>
<td>Dyskinetic cerebral palsy</td>
</tr>
<tr>
<td></td>
<td>Athetoid cerebral palsy</td>
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<tr>
<td>Date</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>-------------------------------------------------------</td>
</tr>
<tr>
<td>10-Feb-2012</td>
<td>Diabetes Mellitus</td>
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<tr>
<td>10-Feb-2012</td>
<td>Type II DM with background retinopathy</td>
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<tr>
<td>10-Feb-2012</td>
<td>Type II DM with over nephropathy</td>
</tr>
<tr>
<td>04-Jan-2004</td>
<td>Hepatitis</td>
</tr>
<tr>
<td>04-Jan-2004</td>
<td>Portal hypertension</td>
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<tr>
<td>04-Jan-2003</td>
<td>Acute upper respiratory infection</td>
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<tr>
<td>09-Jan-2002</td>
<td>Chest infection</td>
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<tr>
<td>01-Feb-1999</td>
<td>Viral hepatitis</td>
</tr>
<tr>
<td>01-Jan-1993</td>
<td>Acute URTI</td>
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</tbody>
</table>

1. Group by Grouping Term ID
2. eHR Description of Grouping Term ID is shown
3. Only extrinsic data from latest progress is shown
### Problem in eHR Viewer

**Detail View**

#### Clinical Note & Summary
- **Problem & Procedure**
  - **Problem / Diagnosis**
    - Hepatitis
      - 04-Jan-2004: Chronic viral hepatitis B infection (Hospital A)
      - 04-Jan-2004: Portal hypertension (Hospital A)
      - 09-Sep-2002: Chronic type B viral hepatitis (Dr Ho)
      - 09-Sep-2002: Ascites (Dr Ho)
      - 04-Dec-2000: Alcoholic hepatitis (Hospital C)
      - 03-Mar-1999: Chronic viral hepatitis B infection (Hospital B)
      - 03-Mar-1999: Portal hypertension (Hospital B)
      - 04-Feb-1999: Viral hepatitis (Dr Chan)

#### Show Local Description

- **Legend**
- **Allergy & ADR**

---

**Show Local Description**

- **Problem**
- **Date**
- **Description**
- **Institution**

**Clinical Note & Summary**
- **Clinical Note & Summary**
- **Referral**
- **Birth Record**

**Encounter**

**Problem & Procedure**
- **Problem / Diagnosis**
- **Procedure**
- **Investigation Report**

**Medication**
- **Prescribing History**
- **Dispensing History**

**Radiology Record**
- **Fluroscopy**
- **Computed Tomography**
- **PET / CT Fusion Imaging**

**Immunisation Record**

---

**WONG, NG SHEU**
- **HKIC: UH9773127**
- **DOB: 04-Jan-1887**
- **Age: 123**

**Legend**

**Allergy & ADR**
<table>
<thead>
<tr>
<th>Date</th>
<th>Provider</th>
<th>Description</th>
<th>Code</th>
<th>System</th>
<th>Term ID</th>
<th>Local Description</th>
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<tbody>
<tr>
<td>3 Jan 2004</td>
<td>Hospital A</td>
<td>Chronic viral hepatitis B infection</td>
<td>B18.1</td>
<td>ICD10</td>
<td>1008</td>
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<td>9 Sep 2002</td>
<td>Dr Ho</td>
<td>Chronic type B viral hepatitis</td>
<td>61977001</td>
<td>SNOMED CT</td>
<td>1008</td>
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<td>4 Dec 2000</td>
<td>Hospital C</td>
<td>Alcoholic hepatitis</td>
<td>K70.1</td>
<td>ICD10</td>
<td>29392</td>
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<td>3 Mar 1999</td>
<td>Hospital B</td>
<td>Chronic viral hepatitis B infection</td>
<td>1008</td>
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<td>1008</td>
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<td>4 Feb 1999</td>
<td>Dr Chan</td>
<td>Viral hepatitis</td>
<td>D72</td>
<td>ICPC2</td>
<td>1023</td>
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<tr>
<td>1 Feb 1999</td>
<td>Dr Wong</td>
<td>Viral hepatitis</td>
<td>V hep</td>
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</tbody>
</table>
## Data Retrieval with ICD 10

**K25.4  Chronic or Unspecified Gastric Ulcer with Haemorrhage**

<table>
<thead>
<tr>
<th>Term ID</th>
<th>Concept Description</th>
<th>ICD10Dx</th>
<th>ICD10Dx Asso</th>
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<tbody>
<tr>
<td>8838</td>
<td>Bleeding chronic gastric ulcer with shock</td>
<td>K25.4</td>
<td>R57.1</td>
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<tr>
<td>9010</td>
<td>Bleeding gastric erosion</td>
<td>K25.4</td>
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<tr>
<td>8841</td>
<td>Bleeding gastric ulcer</td>
<td>K25.4</td>
<td></td>
</tr>
<tr>
<td>8839</td>
<td>Bleeding gastric ulcer and duodenal ulcer</td>
<td>K25.4</td>
<td>K26.4</td>
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<td>8840</td>
<td>Bleeding prepyloric ulcer</td>
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<td>8836</td>
<td>Chronic or unspecified gastric ulcer with haemorrhage</td>
<td>K25.4</td>
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</tr>
<tr>
<td>8842</td>
<td>Chronic or unspecified gastric ulcer with haemorrhage, with obstruction</td>
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<tr>
<td>8837</td>
<td>Gastric ulcer, chronic, with haemorrhage</td>
<td>K25.4</td>
<td></td>
</tr>
</tbody>
</table>
Gastric ulcer

[See at the beginning of this block for subdivisions]

**Incl.:** erosion (acute) of stomach
ulcer (peptic):
  - pylorus
  - stomach

Use additional external cause code (Chapter XX), if desired, to identify drug, if drug-induced.

**Excl.:** acute haemorrhagic erosive gastritis (**K29.0**)
peptic ulcer NOS (**K27.-**)

The following fourth-character subdivisions are for use with categories K25-K28:

.0  Acute with haemorrhage
.1  Acute with perforation
.2  Acute with both haemorrhage and perforation
.3  Acute without haemorrhage or perforation
.4  Chronic or unspecified with haemorrhage
.5  Chronic or unspecified with perforation
.6  Chronic or unspecified with both haemorrhage and perforation
.7  Chronic without haemorrhage or perforation
.9  Unspecified as acute or chronic, without haemorrhage or perforation
Multi-hierarchical Search

- Disorder of respiratory system
  - Disorder of lower respiratory system
    - Disorder of lung
      - Pneumonitis
        - Pulmonary tuberculosis

- Bacterial infectious disease
  - Disease due to Gram-positive bacteria
    - Mycobacterioses
      - Tuberculosis
        - Pulmonary tuberculosis
HKCTT in Practice

• Support clinical documentation
  – Alias
  – Frequency count
• Facilitate decision support
• Provide organised data in eHR Viewer
• Assist data retrieval/reporting
Management of HKCTT

• Governance
  – eHR IS CG, eHR IS DGs, HKCTT EG

• Development
  – Terminology management principles & editorial rules
  – Special handle: nonspecific / vague terms

• Maintenance
  – Information Architecture Management System
  – Quality management
  – Feedback mechanism
  – Regular update
  – Distribution
## 3 ways to Adopt HKCTT

<table>
<thead>
<tr>
<th></th>
<th>HKCTT App</th>
<th>HKCTT Offline</th>
<th>HKCTT Core</th>
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<tbody>
<tr>
<td><strong>Serving</strong></td>
<td>On-ramp / Adaptation</td>
<td>Provider’s system</td>
<td>All HCPs</td>
</tr>
<tr>
<td><strong>HKCTT Content</strong></td>
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<td>Y</td>
<td>Y</td>
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<tr>
<td><strong>Terminology Engine</strong></td>
<td>Y</td>
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</tr>
<tr>
<td><strong>Search Panel</strong></td>
<td>Y</td>
<td></td>
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</tr>
</tbody>
</table>
Tips for Terminology Management

• Meaningless identifier to allow expansion
• Unique meaning
• To facilitate searching
  – Synonyms
  – Common list
• Mapping
  – Check rules of individual terminologies
  – What you see, what you get
  – Must be validated by professionals
• Keep updating

Cimino’s Desiderata
• Content
• Concept oriented
• Concept permanence
• Nonsemantic concept identifier
• Polyhierarchy
• Formal definitions
• Reject “not elsewhere classified”
• Multiple granularities
• Multiple consistent views
• Representing consistent context
• Graceful evolution
• Recognize redundancy
Summary

• Medical terminology
  – Fundamental & essential for management of modern medicine
  – Complex, highly specialised
  – A global effort

• Management of medical terminology
  – Labour intensive
  – Requires specialised management toolset
  – Ongoing activity
Thank You